VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST
(Autonomous & Residential)
[Affiliated to Madurai Kamaraj University]

B.Sc. Physics/ Chemistry Degree (Semester) Examinations, November 2017
Part – III : Allied Subject : Third Semester : Paper –I

MATHEMATICS - I
Under CBCS – Credit 5

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 1 = 10)**

1. $\cosh^2 x + \sinh^2 x =$ _____
   a) 1 b) 0 c) $\cosh 2x$ d) $\sinh 2x$
2. If $x = a\cos^3 t; y = a\sin^3 t$ then y' is
   a) $\sin t$ b) $-\cos t$ c) $\tan t$ d) $-\tan t$
3. If $I = \int_0^{\frac{\pi}{2}} \log(\tan x)dx$ then the value of I=_____
   a) 0 b) 1 c) $\frac{\pi}{4}$ d) $\frac{\pi}{2}$
4. A vector $\vec{f}$ is called solenoidal if _____
   a) grad $\vec{f}$ =0 b) div $\vec{f}$ =0 c) curl $\vec{f}$ =0 d) $\nabla x\vec{g} = 0$
5. Using stoke's theorem, the value of $\int_C \vec{r}.d\vec{r}$ = _____ where
   $\vec{r} = x\vec{l} + y\vec{j} + z\vec{k}$
   a) 1 b) 2 c) 0 d) -1
6. Expand $\tan 70 =$ _____
7. If $y = (\sin x)^Y$ then find $\frac{dy}{dx}$.
8. Find $\int_0^{\frac{\pi}{4}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$
9. If $\vec{r} = x\vec{l} + y\vec{j} + z\vec{k}$ then find grad r^n
10. If $\vec{f} = x^2\vec{\ell} - xy\vec{j}$ and C is the straight line joining the points (0,0) and (1,1) then find $\int_C \vec{f}.d\vec{r}$

SECTION – B

Answer ALL Questions: **(5 × 7 = 35)**

11. a) Expand $\cos^5\theta\sin^3\theta$ in a series of sines of multiples of θ. **(OR)**

b) If $\cos(x+iy)=\cos\theta+i\sin\theta$ then prove that $\cos 2x+\cosh 2y=2$.

12. a) If $\sin y=x\sin(x+y)$ then prove that $y'=\dfrac{\sin^2(x+y)}{\sin x}$. **(OR)**

b) If $y=\tan(x+y)$, then prove that $y''=\dfrac{-2(1+y^2)}{y^5}$.

13. a) Evaluate: $\int_0^{\frac{\pi}{2}}\log(\sin x)dx$ **(OR)**

b) Evaluate: $\int_0^{\log a}\int_0^{x}\int_0^{x+y}e^{x+y+z}dxdydz$

14. a) If $\nabla\phi=(y+\sin z)\vec{\ell}+x\vec{j}+x\cos z\vec{k}$ find $\phi(x,y,z)$. **(OR)**

b) prove that $div(r^n\vec{r})=(n+3)r^n$.

15. a) Verify Green's theorem for the function $\vec{f}=(x^2+y^2)\vec{l}-2xy\vec{j}$ and C is the rectangle in the *xy* plane bounded by *x*=0; *x*=a, y=0 and y=b. **(OR)**

b) Prove that $\iiint_V a^2dv=\iint_S \vec{f}.\hat{n}\,ds$ where $\vec{r}=\phi\vec{a}$ and $\vec{a}=r\phi$,

$\nabla^2\phi=0$.

SECTION – C

Answer any THREE Questions: **(3 × 10 = 30)**

16. i) If $\cosh u=\sec\theta$ then prove that $u=\log_e\left[\tan\left(\dfrac{\pi}{2}+\dfrac{\theta}{2}\right)\right]$

ii) Find the value of θ in radians if $\dfrac{\sin\theta}{\theta}=\dfrac{863}{864}$.

17. If $y=\left[x+\sqrt{(1+x^2)}\right]^m$ then prove that $(1+x^2)y_2+xy_1-m^2y=0$

18. Establish the reduction formula for $I_n=\int_0^{\frac{\pi}{2}}\sin^n x\,dx$ and hence evaluate $\int_0^{\frac{\pi}{2}}\sin^{10}x\,dx$.

19. i) Prove that $div\left(\dfrac{\vec{r}}{r}\right)=\dfrac{2}{r}$

ii) Prove that $\nabla\times\nabla\times\nabla\times\left(\nabla\times\vec{f}\right)=\nabla^4\vec{f}$ if $\vec{f}$ is solenoidal.

20. Evaluate $\iint_S \vec{f}.\hat{n}ds$ where $\vec{f}=\left(x^3-yz\right)\vec{l}-2x^2y\vec{j}+2\vec{k}$ and S is the surface of the cube bounded by *x*=0, *y*=0, *z*=0, *x*=a, *y*=*a* and *z*=*a*.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2017
Part – III : Core Subject : Third Semester : Paper – I

PROGRAMMING IN C
Under CBCS – Credit 3

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: (10 × 1 = 10)

1. _____ can be used to store a value of any datatype.

   a) Identifier b) Tokens c) Variables d) ROM

2. Which statement test the condition before the loop is executed?

   a) for b) do-While c) while d) goto

3. An array can have _____ dimensions.

   a) One b) Multi c) Two d) Infinite

4. A function can return _____ Value.

   a) Two b) Three c) Four d) One

5. Pointers variables designed to hold _____ of variable.

   a) address b) Memory c) Value d) Register

Fill up the Blanks:

6. _____ is the building blocks for program statement.
7. A program stops its execution when a _____ statement is encounted.
8. An array is a group of related data item that share a _____.
9. The name of the structure is referred as _____.
10. _____ function is used to open a file.

SECTION – B

Answer ALL Questions: (5 × 7 = 35)

11. a) Explain about various types of constant in C.

    (OR)

    b) Explain about Primary Data types in C.

12. a) Write the syntax with explanation of about if ….. else statement with example.

    (OR)

    b) Write an short note on goto statement.

13. a) Explain about the initialization of array.

    (OR)

    b) Explain any two string handling function with example.

14. a) Write the syntax of function definition and explain about their implementation.

    (OR)

    b) Differentiate between Structure and Union.

15. a) List out the benefits of Pointers.

    (OR)

    b) Explain with general format and how to declare and open a file?

SECTION – C

Answer any THREE Questions: (3 × 10 = 30)

16. Discuss in detail of about various types of C operators.
17. Illustrate with syntax and explain about various Looping Statements.
18. Write a C program for addition of Two Matrices.
19. Discuss about various categories of a C program.
20. Briefly explain about Input and Output operation in File.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2017
Part – III : Core Subject : First Semester : Paper – I

ALGEBRA AND TRIGNOMETRY
Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 1 = 10)**

1. Suppose that $a+\sqrt{b}$ is a root of the equation where a and b are rational and $\sqrt{b}$ is _____.
   a) rational b) irrational c) real d) complex
2. If α be a root of a reciprocal equation, _____ must also be a root.
   a) 1 bi) α c) $\frac{1}{\alpha}$ d) None
3. If $f'(x)=0$has r real roots, then $f(x)=0$ cannot have more than _____ real roots.
   a) $r+1$ b) r c) $r-1$ d) None
4. $cosh^2x+sinh^2x$ is _____.
   a) 1 b) 0 c) $sinh2x$ d) $cosh2x$
5. If u is called $\log z$, then u and z be any two _____ quantities.
   a) rational b) irrational c) real d) complex
6. If a function involving all the roots of an equation is unaltered in value if any two of roots are interchanged, then it is called a _____ function of the roots.
7. If an equation remains unaltered when x is changed into its reciprocal then it is called _____ equation.
8. Between two consecutive real roots a and b of the equation $f(x)=0$ where $f(x)$ is polynomial, these lies atleast one real root of the equation _____.
9. Expansion of $\tan(A+B+C+\cdots)$ is _____.
10. $Log\ (1+i)$ is _____.

SECTION – B

Answer ALL Questions: **(5 × 7 = 35)**

11. a) Solve the equation $x^4+4x^3+5x^2+2x-2=0$ of which one root is $-1+\sqrt{-1}$. **(OR)**
    b) Find the sum of the cubes of the roots of the equation $x^5=x^2+x+1$.
12. a) Find the relation between the coefficients in the equation $x^4+px^3+qx^2+rx+s=0$ in order that the coefficients of x^3 and x may be removable by the same transformation.
    (OR)
    b) Find the equation whose roots are the squares of the roots of $x^4+x^3+2x^2+x+1=0$.
13. a) Find the nature of the roots of the equation $4x^3-21x^2+18x+20=0$. **(OR)**
    b) Find the multiple root of the equation $x^4-9x^2+4x+12=0$.
14. a) Express $\cos 8\theta$ in terms of $\sin\theta$. **(OR)**
    b) Express $cosh^6\theta$ in terms of hyperbolic cosines of multiples of θ.
15. a) Find $\log(1-i)$. **(OR)**
    b) Sum to infinity the series $c\sin\alpha+\frac{c^2}{2!}\sin 2\alpha+\frac{c^3}{3!}\sin 3\alpha+\cdots$

SECTION – C

Answer any THREE Questions: **(3 × 10 = 30)**

16. Show that the roots of the equation $x^3+px^2+qx+r=0$ are in Arithmetical progression if $2p^3-9pq+27r=0$. Show that the above condition is satisfied by the equation $x^3-6x^2+13x-10=0$.
17. Solve the equation $x^4+20x^3-143x^2+430x+462=0$ by removing its second term.
18. Find the equation $x^3-3x+1=0$ has a root between 1 and 2 correct to three places of decimals by using Horner's method.
19. Expand $sin^3\theta\ cos^5\theta$ in a series of sines of multiples of θ.
20. If $\log\sin(\theta+i\varphi)=L+iB$, then prove that $2e^{2L}=\cos h2\varphi-\cos 2\theta$.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2017
Part – III : Core Subject : First Semester : Paper – II

DIFFERENTIAL CALCULUS
Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 1 = 10)**

1. $\frac{d}{dx}(x^n)$ is _____.
   a) x^{n-1} b) nx^{n-1} c) x^n d) None
2. The derivative of a function of x is also a function of _____.
   a) x b) y c) t d) None
3. The slope of $tan\ \psi$ is _____.
   a) 0 b) ∞ c) 1 d) None
4. For any curve $\frac{ds}{d\theta}$ is _____.
   a) $\frac{p^2}{r}$ b) $\frac{r^2}{p}$ c) $\frac{p^2}{r^2}$ d) $\frac{r^2}{p^2}$
5. If $f(x,y)$ is a homogeneous function of degree n, then $x\frac{\partial f}{\partial x}+y\frac{\partial f}{\partial y}$ is _____.
   a) f b) n c) nf d) None
6. If $\sin x = y$, then that angle x lying between $\pm\frac{\pi}{2}$ such that $\sin x = y$ is called the _____ of $sin^{-1}y$.
7. If u and v are functions of x, then $\frac{d}{dx}(uv)$ is _____.
8. If the tangent and normal at the point p meet the axis of x in T and G respectively and M be the foot of the ordinate, then TM is called the _____.
9. The Cartesian formula for the radius of curvature is _____.
10. If $du = \frac{\partial u}{\partial x}dx + \frac{\partial u}{\partial y}dy$ then du is called the _____ of u.

SECTION – B

Answer ALL Questions: **(5 × 7 = 35)**

11. a) Solve : $\frac{d}{dx}\left(\frac{\sqrt{x}}{2x+3}\right)$.

(OR)

b) Differentiate $tan^{-1}\frac{\cos x}{1+\sin x}$.

12. a) If $xy = ae^x + be^{-x}$, then prove that $x\frac{d^2y}{dx^2}+2\frac{dy}{dx}-xy=0$.

(OR)

b) Find the n^{th} differential coefficient of $x^2\log x$.

13. a) For the cycloid $x = a(1-\cos\theta), y = a(\theta+\sin\theta)$, find $\frac{ds}{dx}$.

(OR)

b) Find $\frac{ds}{d\theta}$ and $\frac{ds}{dr}$ for the cardioid $r = a(1+\cos\theta)$.

14. a) Find the radius of curvature of the curve $x^4+y^4=2$ at the point $(1,1)$.

(OR)

b) Find the coordinates of the centre of curvature of the curve $xy=2$ at the point $(2,1)$.

15. a) Find $\frac{du}{dx}$ when $u = x^2+y^2$ where $y = \frac{1-x}{x}$.

(OR)

b) Verify Euler's theorem when $u = x^3+y^3+z^3+3xyz$.

SECTION – C

Answer any THREE Questions: **(3 × 10 = 30)**

16. Differentiate $y = x\frac{\sqrt{a^2-x^2}}{2}+\frac{a^2}{2}sin^{-1}\frac{x}{a}$.
17. Prove that if $y = \sin(m\ sin^{-1}x)$, $(1-x^2)y_2 - xy_1 + m^2y = 0$.
18. Find the angle at which the radius vector cuts the curve $\frac{l}{r} = 1+e\cos\theta$.
19. Find the evolute of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$.
20. If $u = tan^{-1}\frac{x^3+y^3}{x-y}$, then prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y} = \sin 2u$.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2017
Part – III : Core Subject : Third Semester : Paper – I

DIFFERENTIAL EQUATIONS
Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 1 = 10)**

1. M dx + N dy= 0 is to be exact if
   a) $\frac{\delta M}{\delta x}=\frac{\delta N}{\delta y}$ b) $\frac{\delta M}{\delta y}=\frac{\delta N}{\delta x}$ c) $\frac{\delta M}{\delta y}\neq\frac{\delta N}{\delta x}$ d) $\frac{\delta M}{\delta y\delta x}=\frac{\delta N}{\delta x\delta y}$
2. The complementary function of $(D^2 - 6D + 8)\ y = 0$ is
   a) $y = Ae^{-4\times} + Be^{-2\times}$ b) $y = (A + Bx)\ e^{4\times}$
   c) $y = Ae^{4\times} + Be^{2\times}$ d) $y = Ae^{-4\times} + Be^{2\times}$
3. Total differential equation in three variables is represented by
   a) P dx + Qdy + R dz =0 b) P dx + Q dy = R dz
   c) P dx + R dz = Q dy d) P dx + Q dy = dz
4. $L^{-1}\left(\frac{1}{(s+a)^2}\right)=$
   a) $t\ e^{at}$ b) e^{-at} c) e^{at} d) $t\ e^{-at}$
5. The complete integral of pq = 1 is z =
   a) $ax + \frac{1}{a}y + c$ b) ax + by + c c) bx + ay + c d) $ay + \frac{1}{a}x + c$

Fill in the blanks:

6. The integrating factor in a linear equation $\frac{dy}{dx}+Py=Q$ is _____.
7. The particular integral of $(D^2 + 5D + 6)\ y = e^x$ is _____.
8. Variation of parameter is applicable to _____ equations with _____ coefficients.
9. $L(\sin at)=$_____.
10. In the type F(z,p,q) = 0, the assumption is _____.

SECTION – B

Answer ALL Questions: **(5 × 7 = 35)**

11. a) Form the differential equation by eliminating α and β from $(x - \alpha)^2 + (y - \beta)^2 = r^2$ **(OR)**
    b) Solve $x^2\frac{dy}{dx}+y^2=xy\frac{dy}{dx}$
12. a) Solve $(D^2-3D+2)\ y = \sin 3x$ **(OR)**
    b) Solve $(D^2+D+1)\ y = x^2$
13. a) Solve the equations $\frac{dx}{yz}=\frac{dy}{xz}=\frac{dz}{xy}$ **(OR)**
    b) Solve the equations $2\frac{dx}{dt}+x+\frac{dy}{dt}=\cos t$ and $\frac{dx}{dt}+y+2\frac{dy}{dt}=0$
14. a) Find (i) $L\left(\frac{1-e^t}{t}\right)$ (ii) $L(\sin^2 2t)$ **(OR)**
    b) Find (i) $L^{-1}\left(\frac{s-3}{s^2+4s+13}\right)$
15. a) Solve $p(1+q^2) = q\ (z-1)$ **(OR)**
    b) Solve p + q = x + y

SECTION – C

Answer any THREE Questions: **(3 × 10 = 30)**

16. Solve $(y^2e^{\times} + 2xy)\ dx - x^2\ dy = 0$.
17. Solve $(D^2 + 16)\ y = 2e^{-3x} + \cos 4x$.
18. Solve $\frac{d^2y}{dx^2}+y=\sec x$, using variation of parameters.
19. Solve the equation $\frac{d^2y}{dt^2}+2\frac{dy}{dt}-3y=\sin t$ given that $y=\frac{dy}{dt}=0$ when t = 0
20. Solve $(y^2 + z^2)\ p - xyq = -xz$.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2017
Part – III : Core Subject : Third Semester : Paper – II

NUMERICAL METHODS
Under CBCS – Credit 5

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 1 = 10)**

1. Gauss elimination method is _____ method.
   a) direct b) indirect c) Iterative d) None of these
2. The operator E is _____.
   a) $1 + \nabla$ b) $1 - \nabla$ c) $1 + \Delta$ d) $1 - \Delta$
3. The formula for $\frac{dy}{dx}$ at $x = x_0$ is_____.
   a) $\frac{1}{h}[\Delta_{y_0} - \frac{\Delta^2 y_0}{2} + \frac{\Delta^3 y_0}{3} - .....]$ b) $\frac{1}{h}[\Delta_{y_0} + \frac{\Delta^2 y_0}{2} + \frac{\Delta^3 y_0}{3} - .....]$
   b) $\frac{1}{h}[\frac{\Delta^2 y_0}{2} + \frac{\Delta^3 y_0}{3} - .....]$ d) None of these
4. The error in the Trapezoidal rule is of order _____.
   a) h b) h^2 c) h^3 d)None of these
5. _____ method is the Runge Kutta of I order.
   a) Euler's b) Modified Euler's c) Picard's d) None of these
6. Newton – Raphson's method is also known as _____.
7. Lagrange's method is used to find the value of _____ intervals of space.
8. The process of computing of derivative is called _____.
9. Simpson's 1/3 rule is used in the _____ intervals of space.
10. Picard's iteration formula is _____

SECTION – B

Answer ALL Questions : **(5 × 7 = 35)**

11. a) Use the Newton – Raphson's method to find a real root of $f(x) = xe^{x} - 2 = 0$ **(OR)**

    b) Solve the system of equations using Gauss elimination method $x + y + z = 9$; $2x - 3y + 4z = 13$; $3x + 4y + 5z = 40$

12. a) Prove that (i) $E\nabla = \nabla E = \Delta$ and (ii) $\Delta - \nabla = \delta^2$

(OR)

b) Use divided difference formula to find the function f(10) from the following table

x	4	7	9	12
f(x)	-43	83	327	1053

13. a) From the following values of x and y, obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x = 51$

x	50	60	70	80	90
f(x)	19.96	36.65	58.81	77.21	94.61

(OR)

b) The population of a certain town is shown in the following table.

Year x	1931	1941	1951	1961	1971
f(x)	40.62	60.80	79.95	103.56	132.65

Find the rate of growth of the population in1961.

14. a) Derive the Newton cote's quadrature formula for integration.

(OR)

b) Evaluate $I = \int_0^1 \frac{1}{1+x}\,dx$, correct to three decimal places. Solve this problem by simpson's 1/3 rule with h = 1/6.

15. a) Using Taylor's series method compute y(0.1) correct to three decimal places from $y^1 = 1+xy$ given that y(0) = 2

(OR)

b) Using Euler method to compute y(0.1) and y(0.2) from $y^1 = 1-y$ given that y(0) = 0.

SECTION – C

Answer any THREE Questions : **(3 × 10 = 30)**

16. Find the positive root of $f(x) = x^3-3x+1 = 0$ lying the root between 1 and 2, using the bisection method.

17. Apply Newton's interpolation formula, find the value of f(22) and f(42) from the table:

x	20	25	30	35	40	45
f(x)	354	332	291	260	231	204

18. From the following values of x and y, obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x=520

x	500	510	520	530	540	550
y=log x	6.2146	6.2344	6.2538	6.2729	6.2916	6.3099

19. Evaluate $I = \int_0^1 \frac{1}{1+x^2}\,dx$, using Trapezoidal rule with h = 0.2. Hence determine the value of π.

20. By applying the fourth order Runge – Kutta method to find y(0.1) from $y' = \frac{1}{x+y}$, y(0) = 1.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2017
Part – III : Core Subject : Fifth Semester : Paper – I

STATISTICS
Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 1 = 10)**

1. Spearman's rank correlation coefficient is p = _____.
2. The equation of the regression line of y on x is _____.
3. The conditional probability of P(A/B) = _____.
4. If E(X+C) = 10 and E(X-C) = 6 then the value of C is _____.
   a) 1 b) 2 c) ½ d) 0
5. Mode of the Binomial distribution B(7, 1/4) is _____.
   a) 3 b) 1 c) 2 d) 1 and 2
6. The moment generating function of normal distribution about mean is _____.
7. If σ is not known and n is small then 99% confidence limits for μ is _____.
8. Test statistic for the difference between the mean of a sample and that of a population based on t-test is _____.
   a) $\frac{\bar{x}-\mu}{s\sqrt{n-1}}$ b) $\frac{\bar{x}}{s\sqrt{n-1}}$ c) $\frac{\mu\bar{x}}{s\sqrt{n-1}}$ d) $\frac{\mu}{s\sqrt{n-1}}$
9. The formula for χ^2-test to test the goodness of fit is _____.
   a) $\chi^2=\sum_{i=1}^{n}\frac{(o_i-e_i)}{e_i}$ b) $\chi^2=\sum_{i=1}^{n}\frac{(o_i-e_i)^2}{e_i}$
   c) $\chi^2=\sum_{i=1}^{n}\frac{(o_i-e_i)}{o_i}$ d) $\chi^2=\sum_{i=1}^{n}\frac{(e_i-o_i)^2}{o_i}$
10. The degrees of freedom for χ^2 – variate to test the independence of attributes is _____.
    a) s-1 b) r-1 c) (r-1)(s-1) d) r(s-1)

SECTION – B

Answer ALL Questions: **(5 × 7 = 35)**

11. a) Show that $-1 \le \gamma \le 1$. **(OR)**

b) Find the rank correlation coefficient between the height in c.m. and weight in Kg of 6 soldiers in Indian Army.

Height:	165	167	166	170	169	172
Weight:	61	60	63.5	63	61.5	64

12. a) State and prove Boole's inequality.

(OR)

b) Obtain the mean, median and mode for the following distribution

$$f(x)=\begin{cases}6(x-x^2) & if\ 0<x<1\\ 0 & elsewhere\end{cases}$$

13. a) Six dice are thrown 729 times. How many times do you expect at least 3 dice to show a five of six.

(OR)

b) Assuming that one in 80 births is a case of twins calculate the probability of 2 or more births of twins on a day when 30 births occur using (i) Binomial distribution (ii) Poisson distribution.

14. a) A random sample of 10 boys has the following I.Q. 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q. of 100?

(OR)

b) In one sample of 8 observations the sum of the squares of deviations of the sample values from the sample mean was 84.4 and another sample of 10 observations it was 102.6. Test whether the difference in variances is significant at 5% level using F-test.

15. a) A random sample of size 20 from a population gives the sample standard deviation of 6. Test the hypothesis that the population standard deviation is 9. **(OR)**

b) In 360 tosses of a pair of dice 74 'sevens' and 24 'elevens' are observed. Test the hypothesis that the dices are fair at 5% level of significance.

SECTION – C

Answer any THREE Questions: **(3 × 10 = 30)**

16. The following data relate to the marks of 10 students in the internal test and the university examination for the maximum of 50 in each.

Internal Marks:	25	28	30	32	35	36	38	39	42	45
University Marks:	20	26	29	30	25	18	26	35	35	46

i) Obtain the two regression equations and determine
ii) The most likely internal mark for the university mark of 25.
iii) The most likely university mark for the internal mark of 30.

17. Show that the r^{th} moment for the distribution $f(x) = ce^{-cx}$ where c is positive and $0 \le x < \infty$ is $\frac{r!}{c^r}$ and r^{th} cumulent is $\frac{(r-1)!}{c^r}$.

18. A set of examination marks is approximately distributed with a mean 75 and S.D of 5. If the top 5% of students get grade A and the bottom 25% get grade B what mark is the lowest A and what mark is the highest B?

19. A group of 10 rats fed on a diet A and another group of 8 rats fed on a different diet B recorded the following increase in weight in gms.

Diet A	5	6	8	1	12	4	3	9	6	10
Diet B	2	3	6	8	1	10	2	8	-	-

20. The theory predicts that the proportion of an object available in four groups A, B, C, D should be 9:3:3:1. In an experiment among 1600 items of this object the numbers in the four groups were 882, 313, 287 and 118. Use χ^2 – test to verify whether the experimental result supports the theory.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2017
Part – III : Core Subject : Fifth Semester : Paper – II

MODERN ALGEBRA
Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: (10 × 1 = 10)

1. The range of the function $f:R \to R$ is given by $f(x)= x^2$ is
   a) R b) R^+ c) $R^+ \cup \{0\}$ d) R^*
2. The function $f:R \to R$ defined by $f(x)=3x$ is
   a) bijection b) 1-1 but not onto
   c) not 1-1 but onto d) neither 1-1 nor onto
3. The inverse of an element a in the additive group of integers modulo n is _____.
4. The group S_n has _____ elements.
5. Let H, K be subgroups of a group G then _____
   a) $H \cup K$ is a subgroup of G b) $H \cap K$ is a subgroup of G
   c) $H \chi K$ is a subgroup of G d) HK is a subgroup of G
6. In the quotient group $\frac{G}{N}$, N is _____.
   a) any proper subgroup of G b) a cyclic subgroup of G
   c) a normal subgroup of G d) a proper abelian subgroup of G
7. The kernel of the homomorphism $f:(z,+) \to (z,+)$ given $f(x) =2x$ is _____.
8. The number of automorphism of a cyclic group of order 'n' is ____.
   a) $\phi(n)$ b) n c) n^2 d) 1
   ($\phi(n)$ is the number of positive integers less than n and relatively prime to n).
9. Let R be a ring with identity, then for all $a, b \in R$, we have $(a+b)^2$=_____.
10. If R be a commutative ring with identity, then every maximal ideal of R is a _____ of R.

SECTION – B

Answer ALL Questions: (5 × 7 = 35)

11. a) If p and σ are equivalence relations defined on a set S, prove that $p \cap \sigma$ is an equivalence relation.

    (OR)

    b) Show that $f:R-\{3\} \to R-\{1\}$ given by $f(x) = \frac{x-2}{x-3}$ is a bijection and find its inverse.
12. a) Prove that a non-empty subset H of a group G is a subgroup of G *iff* $a, b \in H \Rightarrow ab^{-1} \in H$. **(OR)**
    b) Show that a subgroup of a cyclic group is cyclic.
13. a) If G is a finite group with even number of elements then prove that G contains at least one element of order 2.

    (OR)

    b) State and prove lagrange's theorem.
14. a) Let G be any group. Show that $f:G \to G$ given by $f(x) =x^{-1}$ is an isomorphism $\Rightarrow$ G is abelian.

    (OR)

    b) State and prove Cayley's theorem.
15. a) Prove that a finite commutative ring R without zero-divisors is a field. **(OR)**
    b) Let R be a commutative ring with identity. Prove that R is a field *iff* R has no proper ideals.

SECTION – C

Answer any THREE Questions: (3 × 10 = 30)

16. i) If $f: A \to B$ and $g: B \to C$ are bijections, prove that $(g \circ f)^{-1}=f^{-1} \circ g^{-1}$
    ii) Prove that a set X is infinite *iff* there exists a bijection between X and a proper subset A of X.
17. Let A and B be two subgroups of a group G. Prove that AB is a subgroup of G *iff* AB = BA.
18. Let H and K be two subgroups of G of finite index in G. Prove that $H \cap K$ is a subgroup of finite index in G.
19. State and prove fundamental theorem of homomorphism.
20. Let R be a commutative ring with identity. Prove that an ideal M of R is maximal *iff* R/M is a field.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2017
Part – III : Core Subject : Fifth Semester : Paper – III

REAL ANALYSIS
Under CBCS – Credit 5

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: (10 × 1 = 10)

1. One of the following is uncountable.
   a) N x N (b) N (c) Q^+ (d) R
2. A is closed iff
   a) A = Int A (b) A = $\bar{A}$ (c) A $\subseteq \bar{A}$ (d) Int A $\subseteq$ A
3. R is of …….. category.
   a) 1st (b) 2nd (c) both 1st & 2nd (d) neither 1st nor 2nd
4. Any continuous image of connected set is
   (a) connected (b) disconnected
   (c) bounded (d) countable
5. A subset A of R is compact iff A is
   (a) bounded (b) closed
   (c) bounded and closed (d)neither closed nor bounded
6. Let (M,d) be a metric space and A$\subseteq$M. If ……. then A is called bounded subset of M.
7. A subset A of a metric space M is said to be dense in M if ……
8. Let (M_1,d_1) and (M_2,d_2) be metric spaces. If a function $f:M_1\to M_2$ is …… then 'f' is called a homeomorphism.
9. Let (M,d) be a metric space. If M can be represented as the union of two disjoint non-empty open sets then M is ……
10. A family of open sets $\{G_\alpha\}$ in a metric space (M, d) is a open cover for M if …….

SECTION – B

Answer ALL Questions: (5 × 7 = 35)

11. a) Show that (0, 1] is uncountable. **(OR)**
    b) Let (M,d) be a metric space and $d_1(x,y) = \min\{1, d(x, y)\}$. Prove that d_1 is metric on M.
12. a) In any metric space, Show that every closed ball is a closed set. **(OR)**
    b) Let M be a metric space and M_1 a subspace of M. Let $A_1\subseteq M_1$. Show that A_1 is open M_1 iff there exists an open set A in M such that $A_1 = A\cap M_1$
13. a) Show that C with usual metric is Complete. **(OR)**
    b) Let (M_1,d_1) and (M_2,d_2) be metric spaces. Show that $f:M_1\to M_2$ is continuous iff $f^{-1}(G)$ is open in M_1 whenever G is open in M_2.
14. a) Let (M,d) be a metric space and A be connected subset of M . Let B be a subset of M s.t. $A \subseteq B \subseteq \bar{A}$. Show that B is connected. **(OR)**
    b) Show that a metric space M is connected iff there does not exist a continuous function f from M onto the discrete metric space {0, 1}
15. a) Prove that a metric space (M, d) is totally bounded iff every sequence in M has a Cauchy subsequence. **(OR)**
    b) Let (M,d) be a metric space and A$\subseteq$M. Prove that A is compact iff given a family of open sets $\{G_\alpha\}$ in M s.t. $\bigcup G_\alpha \supseteq A$, $\exists$ a subfamily $G_{\alpha_1}, G_{\alpha_2}, ..., G_{\alpha_n}$ s.t. $\bigcup_{i=1}^{n} G_{\alpha_i} \supseteq A$.

SECTION – C

Answer any THREE Questions: (3 × 10 = 30)

16. State and prove Holder's inequality.
17. Let (M,d) be a metric space. Let A,B$\subseteq$M. Show that
    (i) A is open iff A = Int A
    (ii) Int A = Union of all open sets contained in A
    (iii) Int A is the largest open set contained in A
    (iv) A$\subseteq$B $\Rightarrow$ Int A $\subseteq$ Int B
    (v) Int(A$\cap$B) = Int A $\cap$ Int B
    (vi) Int(AUB) $\supseteq$ Int A U Int B
18. State and prove Baire's Category theorem.
19. Prove that a subspace of R is connected iff it is an interval.
20. State and prove Heine Borel Theorem.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2017
Part – III : Core Subject : Fifth Semester : Paper – IV

STATICS
Under CBCS – Credit 4

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 1 = 10)**

1. The resultant of two equal forces P, P at an angle α is …….. in a direction bisecting the angle between them.
   a) $Pcos\alpha$ b) $2Pcos\alpha$ c) $2Pcos\frac{\alpha}{2}$ d) $Pcos\frac{\alpha}{2}$
2. Two couples in the same plane whose moments are equal and of the same sign are ……. to one another.
   a) equivalent b) proportional
   c) perpendicular d) opposite
3. If three forces acting on a rigid body keep it in equilibrium, they must be
   a) concurrent b) all parallel
   c) concurrent and all parallel d) concurrent or all parallel
4. When motion ensues by one body sliding over another, the friction exerted is called
   a) statical friction b) limiting friction
   c) dynamical friction d) force of friction
5. The length of perpendicular from foot of the ordinate on the tangent at any point of the catenary is
   a) zero b) constant
   c) $\sqrt{2}$ d) radius of curvature of catenary
6. The converse of the Polygon of Forces is not ……..….
7. When forces act on a particle, the only motion that can occur is a motion of ……
8. Any system of forces acting in one plane on a rigid body can be reduced to a single force or ……...
9. The coefficient of friction is equal to the tangent of ……
10. The tension at any point is ……. to the height of the point above the oigin.

SECTION – B

Answer ALL Questions: **(5 × 7 = 35)**

11. a) A weight is supported on a smooth plane of inclination α by a string inclined to the horizon at an angle γ, if the slope of the plane be increased to β and the slope of the string unaltered, the tension of the string is doubled. Prove that $\cot\alpha - 2\cot\beta = \tan\gamma$ **(OR)**

    b) State and prove Lami's theorem.

12. a) Two men carry a load of 224 kg weight which hangs from a light pole of length 8m, each end of which rests on a shoulder of one of the men. The point from which the load is hung is 2m nearer to one man than the other. What is the pressure on each shoulder? **(OR)**

    b) If two couples, whose moments are equal and opposite, act in the same plane upon a rigid body, show that they balance one another.

13. a) Forces F_1, F_2, F_3, F_4, F_5, F_6 act along the sides of a regular hexagon taken in order. Show that they will be in equilibrium if (i) $F_1+F_2+F_3+F_4+F_5+F_6 = 0$ and $F_1-F_4=F_3-F_6=F_5-F_2$. **(OR)**

    b) A uniform rod of length a, hangs against a smooth vertical wall being supported by means of a string of length ℓ, tied to one end of the rod, the other end of the string being attached to a point in the wall; Show that the rod can rest inclined to the wall at an angle θ given by

$$\cos^2\theta = \frac{\ell^2 - a^2}{3a^2}$$

14. a) Two particles P and Q each of weight W on two equally rough inclined planes CA and CB of the same height, placed back to back are connected by a light string which passes over the smooth top edge C of the planes. Show that, if the particles are on the point of slipping, the difference of the inclinations of the planes is double the angle of friction. **(OR)**

    b) If a body is at rest on a rough inclined plane of inclination α to the horizon, being acted on by a force making an angle θ with the plane, find the limiting values of the force, necessary to keep the body in equilibrium.

15. a) Derive Cartesian equation to the catenary. **(OR)**

    b) A uniform chain of length l is to be suspended from two points in the same horizontal line so that either terminal tension is n times that at the lowest point. Show that the span must be

$$\frac{l}{\sqrt{n^2-1}}\log\left(n+\sqrt{n^2-1}\right)$$

SECTION – C

Answer any THREE Questions: **(3 × 10 = 30)**

16. Two beads of weight w and w' can slide on a smooth circular wire in a vertical plane. They are connected by a light string which subtends an angle 2β at the centre of the circle when the beads are in equilibrium on the upper half of the wire. Prove that the inclination of the string to the horizontal is given by $\tan\alpha = \frac{w-w'}{w+w'}\tan\beta$

17. State and prove Varignon's theorem of Moments.

18. A beam of weight W hinged at one end is supported at the other end by a string so that the beam and the string are in a vertical plane and make the same angle θ with the horizon. Show that the reaction at the hinge is

$$\frac{W}{4}\sqrt{8+\operatorname{cosec}^2\theta}$$

19. A weight can be supported on a rough inclined plane by a force P acting along the plane or by a force Q acting horizontally. Show that the weight is

$$\frac{PQ}{\sqrt{(Q^2\sec^2\lambda - P^2)}}$$ where λ is the angle of friction.

20. If α, β be the inclinations to the horizon of the tangents at the extremities of a portion of a common catenary and l the length of the portion, Show that the height of the one extremity above the other is $l\,\frac{\sin\frac{\alpha+\beta}{2}}{\cos\frac{\alpha-\beta}{2}}$, the two extremities being on one side of the vertex of the catenary.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2017
Part – III : Elective Subject : Fifth Semester : Paper – I

LINEAR PROGRAMMING
Under CBCS – Credit 5

Time: **3** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 1 = 10)**

1. LPP involving _____ variables can be easily solved by the graphical method.
   a) one b) two c) three d) four
2. The method of solving an LPP in which a high penalty cost has been assigned to the _____ variables is called the Big-M method.
   a) slack b) surplus c) artificial d) degenerate
3. The dual of the dual is _____
   a) dual b) slack c) surplus d) primal
4. For a feasible solution to exist, it is necessary that total supply _____ total requirements.
   a) equals b) unequals c) unity d) zero
5. If $\underline{\gamma} = 0 = \overline{\gamma}$, the game is said to be _____
   a) fair b) strictly determinable
   c) saddle point d) pay off
6. A basic solution to the system A×=B is called _____ of one or more of the basic variables vanish.
7. The method of penalties can be carried out into the _____ major steps.
8. If the primal problem is unbounded then the dual problem does not have _____
9. An IBFS can be constructed by selecting the _____ basic variables.
10. To determine an assignment schedule is known as _____ Assignment method.

SECTION – B

Answer ALL Questions: **(5 × 7 = 35)**

11. a) Solve the LPP graphically: Max z = $5x_1+3x_2$

s.t.c., $3x_1+5x_2 \le 15; 5x_1+2x_2 \le 10; x_1, x_2 \ge 0$ (OR)

b) Define the following: i) Slack variable
ii) Degenerate solution
iii) Optimum solution.

12. a) Use simplex method, solve the LPP Max z = $3x_1+5x_2$

s.t.c., $3x_1+2x_2 \le 18; x_1 \le 4; x_2 \le 6; x_1, x_2 \ge 0$ (OR)

b) Explain the Big-M method of a LPP.

13. a) Distinguish between the primal and dual problem. (OR)

b) Prove that the dual of the dual is primal.

14. a) Find an IBFS for the following TP by NCWR**:-**

	D	E	F	G	
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
	200	225	275	250	

(OR)

b) Solve the following Transportation problem by VAM **:-**

$$\begin{pmatrix} 27 & 23 & 31 & 69 \\ 10 & 45 & 40 & 32 \\ 30 & 54 & 35 & 57 \end{pmatrix} \begin{matrix} 150 \\ 40 \\ 80 \end{matrix}$$

90 70 50 60

15. a) Define Assignment problem. Write down the mathematical from of an Assignment problem. (OR)

b) Solve the game **:-** $\begin{matrix} \\ P/A \end{matrix} \overset{P/B}{\begin{pmatrix} 2 & 5 \\ 7 & 3 \end{pmatrix}}$

SECTION – C

Answer any THREE Questions: **(3 × 10 = 30)**

16. Find all the basic feasible solution of the equations

$2x_1+6x_2+2x_3+x_4=3; 6x_1+4x_2+4x_3+5x_4=2$

17. Use simplex method. Solve the LPP *Max* $z=3x_1+5x_2+4x_3$

s.t.c., $2x_1+3x_2 \le 8; 2x_2+5x_3 \le 10; 3x_1+2x_2+4x_3 \le 15; x_1, x_2, x_3 \ge 0$

18. Use Big-M method. Solve the LPP *Max* $z=3x_1+2x_2$

s.t.c., $3x_1+4x_2 \ge 12; 2x_1+x_2 \le 2; x_1, x_2 \ge 0$

19. Find an optimum solution for the following TP by VAM **:-**

	To				
	21	16	25	13	11
From	17	18	14	23	13
	32	27	18	41	19
	6	10	12	15	

20. Solve the following Assignment problem **:-**

	P	Q	R	S	T
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	15
D	21	24	17	28	26
E	14	10	12	11	15

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B.A./B.Sc. Degree (Semester) Examinations, November 2017
Part – IV : NME Subject : First Semester : Paper – I

FUNDAMENTALS OF MATHEMATICS

Under CBCS – Credit 2

Time: **2** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 1 = 10)**

1. 1+2+3+4+.....+n is equal to

   a) n^2 b) 0 c) $\frac{n}{2}$ d) $\frac{n(n+1)}{2}$

2. In the ratio 3:2 = a:8, the value of a is

   a) 10 b) 8 c) 14 d) 12

3. Find the diagonal matrix

   $a)\begin{bmatrix}1&2&-2\\3&4&-1\\5&1&0\end{bmatrix}$ $b)\begin{bmatrix}0&1&0\\1&2&1\\0&1&1\end{bmatrix}$ $c)\begin{bmatrix}1&2&3\\0&0&0\\3&2&1\end{bmatrix}$ $d)\begin{bmatrix}1&0&0\\0&2&0\\0&0&3\end{bmatrix}$

4. Find the identity Matrix

   $a)\begin{bmatrix}0&0&1\\0&0&1\\0&1&1\end{bmatrix}$ $b)\begin{bmatrix}1&0&0\\0&1&0\\0&0&1\end{bmatrix}$ $c)\begin{bmatrix}0&0&1\\0&1&0\\0&0&1\end{bmatrix}$ $d)\begin{bmatrix}0&0&0\\0&0&0\\0&0&1\end{bmatrix}$

5. The slope of the straight line $ax+by+c=0$ is,

   $a)\frac{c}{a}$ $b)\frac{c}{b}$ $c)\frac{b}{a}$ $d)\frac{-a}{b}$

6. Sequence of numbers is called _____.
7. The slope of the straight line joining the points (x_1, y_1) and (x_2, y_2) is _____.
8. The fifth term in the G.P. 3,6,12,..... is _____.
9. Write the equivalent ratio for 32/96 is _____.
10. The 10^{th} term of the A.P. 3,5,7,9,..... is _____.

SECTION – B

Answer ALL Questions: **(4 × 10 = 40)**

11. a) The daily incomes of A and B are in the ratio 2:3. If the income of each of them increases by Rs.50 per day, the income ratio become 10:17. Calculate the incomes of A and B.

(OR)

b) i) Simplify $\dfrac{2^{0^3} \times 4^{2^0}}{16^{3/2}}$

ii) Express the following as a power of 5

$\dfrac{125^4}{25}$

12. a) If $A = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 0 & 1 \\ 1 & 2 & 1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 & 1 \\ 0 & -1 & 0 \\ 2 & 0 & -1 \end{bmatrix}$, $C = \begin{bmatrix} 1 & 0 & -1 \\ -2 & 0 & 1 \\ 1 & 2 & -1 \end{bmatrix}$ verify (AB)C = A(BC).

(OR)

b) If $A = \begin{bmatrix} 2 & 4 \\ 3 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 2 & -3 \\ 1 & 0 \end{bmatrix}$ prove that $(2A + 5B)^T = 2A^T + 5B^T$

13. a) Find the value of 'a' if the line joining (4,a) and (6,3) is parallel to the line joining (4,7) and (5,9).

(OR)

b) If A(3,7), B(-2,*x*) and C(5,2) are coordinators of three points and AB = AC, find the value of *x*.

14. a) Find the sum of the series 2+7+12+17+.....+152

(OR)

b) Find the sum to n terms of the series 6+66+666+.....+n terms.

SECTION – C

Answer any THREE Questions: **$\left(2 \times 12\frac{1}{2} = 25\right)$**

15. Find the three numbers in A.P. whose sum is 12 and the sum of whose cubes is 408.

16. If $A = \begin{bmatrix} 1 & 5 & 2 \\ 3 & -2 & 4 \\ 6 & 2 & 1 \end{bmatrix}$ find A^{-1}.

17. If a line passes through (2,-5) and (4,6), find the equation of the line.

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B.Sc. Mathematics Degree (Semester) Examinations, November 2017
Part – IV : Skill Based Subject : Third Semester : Paper – I

MATHEMATICAL LOGIC
Under CBCS – Credit 2

Time: **2** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: (10 × 1 = 10)

1. Write the following statements in symbolic form with statements.
   P: Divya is smart, **Q**: Sakthi is smart
   a) Divya is smart and Sakthi is not smart.
   b) Divya and Sakthi are both smart.
   c) Divya is smart but Sakthi is not smart.
   d) Neither Divya nor Sakthi are smart.
2. Which one of the following is an idempotent law?
   a) $P \vee P \Leftrightarrow P$ b) $P \to Q$ c) $P : Q \to R$ d) $P \vee \neg P$
3. Which one of the following is an implications?
   a) $(P \to Q); R$ b) $(\neg Q \to \neg P)$ c) $\neg P \wedge \neg R$ d) $P \wedge Q \Rightarrow P$
4. Which one of the following is the conjunction statements?
   a) Devika and Anamika like mushroom
   b) Devika like mushroom
   c) Anamika like mushroom
   d) None of these
5. Which one of the following is biconditional symbol?
   a) $\neg$ b) $\wedge$ c) $\Leftrightarrow$ d) $\rightleftarrows$
6. $\neg P \to Q =$ _____.
7. If the truth value of "P" is T, then the truth value of $\neg P$ is _____.
8. If each entry in the final column of the truth table T is called _____.
9. Two formulas A and B are said to be equivalent to them. If $A \Leftrightarrow$ is _____.
10. Demorgan's laws are _____.

SECTION – B

Answer ALL Questions: (4 × 10 = 40)

11. a) Give truth table for i) $P \wedge \neg P$ ii) $P \vee \neg P$.

(OR)

b) Construct the truth table.
$(P \wedge Q) \vee (\neg P \wedge Q) \vee (P \wedge \neg Q) \vee (\neg P \wedge \neg Q)$.

12. a) Verify whether i) $(P \vee Q) \to P$ is a tautology.
ii) $(P \vee \neg P)$ is a tautology.

(OR)

b) Verify whether $((P \wedge P \rightleftarrows)) \to Q$ is a tautology.

13. a) Prove by truth table method.
$P \vee Q \Leftrightarrow \neg(\neg P \wedge \neg Q)$.

(OR)

b) Prove by Replacement process.
$(P \to Q) \wedge (R \to Q) \Leftrightarrow (P \vee R) \to Q$.

14. a) Prove that $(\neg P \wedge (\neg Q \wedge R)) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$.

(OR)

b) Prove that $P \to (Q \to R) \Rightarrow \neg P \to (P \to Q)$.

SECTION – C

Answer any TWO Questions: ($2 \times 12\frac{1}{2} = 25$)

15. Construct the truth table for $P \to (Q \to R)$.
16. Prove by law of duality.
    i) $\neg(P \wedge Q) \to (\neg P \vee (\neg P \vee Q)) \Leftrightarrow (\neg P \vee Q)$
    ii) $(P \vee Q) \wedge (\neg P \wedge (\neg P \wedge Q)) \Leftrightarrow (\neg P \wedge Q)$
17. Prove that $(P \to Q) \Rightarrow (\neg Q \to \neg P)$

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B.Sc. Mathematics Degree (Semester) Examinations, November 2017
Part – IV : Skill Based Subject : Fifth Semester : Paper – I

QUANTITATIVE APTITUDE
Under CBCS – Credit 2

Time: **2** Hours Max. Marks: **75**

SECTION – A

Answer ALL Questions: **(10 × 1 = 10)**

1. At what rate percent per annum will a sum of money double in 14 years?
   a) 6 ¼ % p.a. b) 14 ½ % p.a. c) 8⅓ % p.a. d) 6 ½ % p.a.
2. Jothi is younger than Ramesh by 4 years. If their ages are in the respective ratio of 7:9, how old is Jothi?
   a) 16 years b) 18 years c) 20 years d) None of these
3. In what time will a train 100 metres long cross an electric pole if its speed be 144 km/hr?
   a) 2.5 seconds b) 4.25 seconds c) 5 seconds d) 12.5 seconds
4. January 1, 2007 was Monday. What day of the week lies on Jan 1, 2008?
   a) Monday b) Tuesday c) Wednesday d) Sunday
5. A 9% stock yields 8%. The market value of the stock is
   a) Rs.72 b) Rs.92 c) Rs.112.50 d) Rs.116.50
6. A and B can complete a work in 4 days. If A alone can complete the same work in 12 days, then B can complete the same work in _____ days.
7. A does a work in 10 days and B does the same work in 15 days. Then they together will do the same work in _____ days.
8. A train moves with a speed of 108 kmph. Its speed in metres per second is _____.
9. A speed of 14 metres per second is the same as _____.
   a) 28 km/hr b) 46.6 km/hr c) 50.4 km/hr d) 70 km/hr
10. The annual income derived from Rs.2500, 8% stock at 106 is_____.

SECTION – B

Answer ALL Questions: **(4 × 10 = 40)**

11. a) i) A can do a certain job in 12 days. B is 60% more efficient than A. How many days does B alone take to do the same job?

ii) A and B together can complete a piece of work in 4 days. If A alone can complete the same work in 12 days, in how many days can B alone complete that work?

(OR)

b) i) A cyclist covers a distance of 750 m in 2 min 30 seconds. What is the speed in km/hr of the cyclist?

ii) Mohan is travelling on his cycle and has calculated to reach the point A at 2.p.m. if he travels at 10 kmph. He will reach there at 12 Noon, if he travels at 15 kmph. At what speed must he travel to reach A at 1.P.M.?

12. a) i) A train is moving at a speed of 132 km/hr. If the length of the train is 110 metres, how long will it take to cross a railway platform 165 metres long?

ii) Two trains 100 metres and 120 metres long are running in the same directions with speeds of 72 km/hr and 54 km/hr. In how much time will the first train cross the second?

(OR)

b) i) A sum of Rs. 800 amounts to Rs.920 in 3 years at simple interest. If the interest rate is increased by 3% it would amount to how much?

ii) What should be the least number of years in which the simple interest on Rs.2600 at $6\frac{2}{3}$ % will be an exact number of rupees?

13. a) i) A sum of money doubles itself at compound interest in 15 years. In how many years will it become eight times?

ii) What is the difference between the compound interests on Rs.5000 for 1 ½ years at 4% per annum compounded yearly and half yearly? **(OR)**

b) i) What was the day of the week on 16th July 1776?

ii) January 1, 2007 was Monday. What day of the week lies on Jan 1, 2008?

14. a) i) How much does a watch lose per day, if its hands coincide every 64 minutes?

ii) At what times between 7 and 8 o'clock will the hands of a clock be in the same straight line but, not together?

(OR)

b) i) Find the annual income derived from Rs.2500, 8% stock at 106.

ii) Find the cost of 96 shares of Rs. 10 each at 3/4 discounts, brokerage being 1/4 per share.

SECTION – C

Answer any TWO Questions: **($2 \times 12\frac{1}{2} = 25$)**

15. A and B can do a piece of work in 18 days. B and C can do it in 24 days, A and C can do it in 36 days. In how many days will A,B and C finish it, working together and separately?

16. A man sells Rs.5000, 12% stock at 156 and invests the proceeds partly in 8% stock at 90 and 9% stock at 108. He there by increases his income by Rs.70. How much of the proceeds were invested in each stock?
17. Two trains starting at the same time from two stations 200km apart and going in opposite directions cross each other at a distance of 110 km from one of the stations. What is the ratio of their speeds?